# VETCHES

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WITH A CHAPTER ON

VETCH SEED AND ITS ADULTERANTS

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VETCHES make excellent feed, either green or as hay, and are also exceedingly useful as cover and green-manure crops.

Vetches are usually seeded with enough small grain to make half a stand. Sixty pounds of common-vetch or 40 pounds of hairy-vetch seed are enough for an acre.

Inoculation is necessary for the successful growth of vetches and must be supplied where they are grown for the first time.

With seed at a reasonable price, hairy vetch is the best winter legume for all localities in the eastern half of the United States where red clover fails or where crimson clover is not a success.

# VETCHES.

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## VARIETIES OF VETCH.

THE TERM "VETCH" has in common usage a rather loose application. Properly it refers to species of the botanical genus Vicia, but it is in the case of some cultivated plants applied to species in related groups of plants. Thus crown vetch is a species of Coronilla, kidney vetch is *Anthyllis vulneraria*, Dakota vetch is a species of Hosackia, and several of the vetchlings, species of Lathyrus, are sometimes called "vetch." Another species, *Vicia faba*, is extensively cultivated and has numerous varieties, known as broad beans, Windsor beans, sow beans, horse beans, etc., but the name "vetch" is never used in referring to this crop.

In the United States about 20 wild kinds occur and are commonly known as wild peas. Many of the species of vetch have been more or less extensively cultivated, and several others growing wild are utilized for hay or pasturage, or in a few cases the seeds are used for human food.

The cultivated kinds[1] include the following: Common vetch, or tares; hairy, sand, or Russian vetch; black bitter vetch; scarlet vetch; purple vetch; Narbonne vetch; narrow-leaf or Augusta vetch. Only two kinds of vetches, namely, the common vetch and the hairy vetch, are much grown in the United States, but other species are likely to become of increasing importance. Thus, purple vetch is growing in favor as a cover crop in California, while the scarlet, bitter, and woolly-podded vetches are all excellent and with cheaper seed would certainly be largely grown.

[1] Common vetch (*Vicia sativa*), hairy vetch (*Vicia villosa*), bitter vetch (*Vicia ervilia*), scarlet vetch (*Vicia fulgens*), purple vetch (*Vicia atropurpurea*), Narbonne vetch (*Vicia narbonnensis*), narrow-leaf vetch (*Vicia angustifolia*), Hungarian vetch (*Vicia pannonica*), woolly-podded vetch (*Vicia dasycarpa*).

## COMMON VETCH.

Common vetch is strictly an annual, having much the same habit as the garden or English pea, but the stems are more slender and usually taller, growing 3 to 5 feet or more in length. The leaves are pinnate, with about seven pairs of leaflets and a terminal tendril. The flowers are violet purple, rarely white, and borne in pairs on a very short stalk. The pods are brown and bear four or five seeds, which are brown or marbled in the commonest varieties. At maturity the pod valves split and coil readily, discharging the seeds. There are numerous varieties, distinguished mainly by the color and size of the seeds, such as gray vetch, brown vetch, pearl vetch, etc.

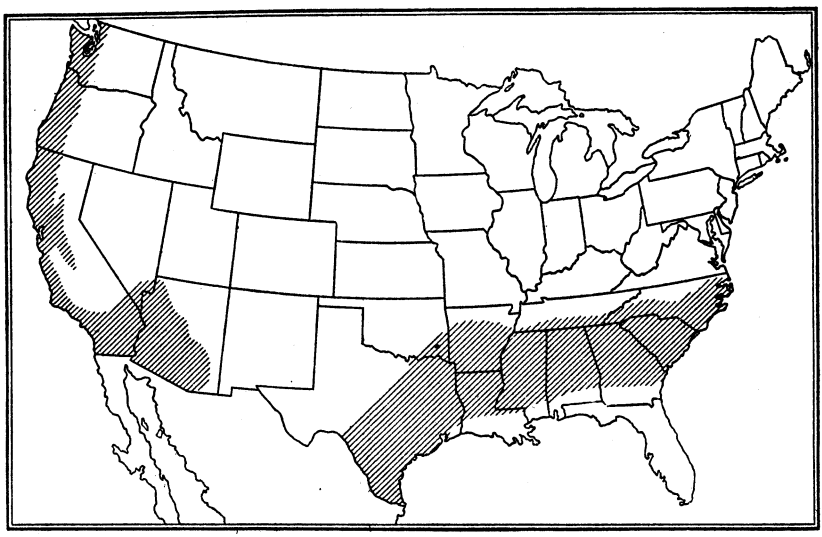

FIG. 1.—Map of the United States, showing the regions suited to the fall seeding of common vetch.

Pearl or white vetch has white seeds, often used as food after the manner of lentils. The brown-seeded varieties also are edible, but not so desirable. There are both spring and winter strains of common vetch, distinguished in European agriculture as spring vetch and winter vetch. Owing to the fact that the seed is grown largely in western Oregon, where it is usually fall sown, it has also become known as Oregon winter vetch. In contrast with hairy vetch, common vetch is also known as smooth vetch, and sometimes the name English vetch is applied to it. The gray-seeded variety of common vetch is the one most cultivated in the United States.

Common vetch is largely grown as a winter crop with oats or wheat for hay in western Oregon and western Washington, as a winter green-manure crop in the citrus districts of southern California, and as a winter crop, usually with oats, rye, or barley, in

the Southern States. (See fig. 1.) As a spring-sown crop it succeeds only where the summers are fairly cool, hot humid weather being injurious to it. The winter strain of common vetch will ordinarily be but little injured by a temperature as low as 10° F., but zero weather results in much winterkilling. Like other legumes, vetch is adapted to a variety of uses, such as hay, green feed, pasturage, and green manure.

### SOIL REQUIREMENTS.

Common vetch prefers a well-drained soil and will not thrive in poorly drained land. It does best in loams or sandy loams, though excellent crops are grown both on sandy and gravelly soils. On poor lands vetch is often used as a soil improver, and while the yield may not be large it is often good farm practice. On poor soils special care should be taken to provide thorough inoculation, as without it failures commonly result.

The seed bed for common vetch should be quite firm. For this reason it is a common practice in Oregon to broadcast the seed in wheat or oat stubble and then go over it with an ordinary disk harrow, or if the land is fairly loose the seed is simply sown in the stubble with a disk drill. This method gives satisfactory results, especially if the previous small-grain crop has been spring sown and if the vetch is sown quite early in the fall. If the planting is done later or if the previous grain crop was fall sown, the land is usually too compact and thorough preparation of the soil is advantageous.

In the South special preparation of the soil before planting vetch is usually necessary. But few successes have thus far been noted by planting in cotton or some other cultivated crop, but where the soil is thoroughly inoculated this method has given excellent results.

### METHODS OF SOWING.

Common vetch seed may be sown either broadcast or by drilling. Broadcasting is the older method and perhaps still the most common, but the use of the drill has greatly increased in recent years, especially in Oregon. Conflicting opinions are held among Oregon growers as to the relative merits of broadcasting and drilling. Drilling undoubtedly has the advantage of being more economical in the use of seed. It is further contended that it lessens winterkilling by favoring the deeper rooting of the plant, so that there is less injury from frost heaving. This contention seems probable, but it is not definitely proven.

Vetch may be sown alone or with one of the small grains as a supporting crop. To sow with grain has been and still is the commoner practice where the crop is grown mainly for hay, as the grain furnishes a support for the weak stems of the vetch and prevents

lodging to a considerable extent. Oats are the favorite grain to use in combination with vetch, though wheat, rye, and barley may be used. Oats are preferred, not only on account of the superior quality of oat hay, but from the further fact that where a seed crop is grown the oat seed can be readily separated from the vetch seed, while there is greater difficulty with rye, wheat, or barley.

Where vetch is used mainly as a green-manure crop, as in southern California, it is nearly always sown alone. In late years in Oregon the tendency has been to plant vetch alone when the crop is grown for seed. This change has been brought about as a result of the high prices charged for thrashing, the same price being charged for thrashing vetch and wheat or oats combined as for vetch alone. Growers did not like to pay the high price for thrashing the small grain in this combination, and as machinery for handling vetch alone came into use the small grain was omitted. This is especially true in sections raising seed for shipment out of the State. Many smaller sections still use a small grain in combination with vetch for seed. Formerly wheat was used for this purpose, but now oats are generally employed. Gray Winter and Black Russian oats are preferred, because these varieties have stiff straws.

### TIME OF SOWING.

Common vetch is usually sown in the fall, from September till as late as December. In western Oregon and western Washington most of it is seeded in October, but a growing tendency is to plant it in September when weather conditions will permit, as the damage by winterkilling seems to be reduced. Pearl vetch, which is not winter hardy, is planted toward the end of March, and it is not uncommon to plant common vetch at the same time. Indeed, some dairy farmers plant it at various dates, so as to use it to feed green. Sown with oats about October 1, it is ready to feed about May 1; planted later, it can be cut about June 1; and if early spring sowing, in February or March, is practiced, the vetch can be fed from June 15 to July 15. When cut early for soiling, a small second crop may be cut or used as pasture.

In southern California, when used for green-manuring purposes, common vetch is sown in late August or early September, so that it can be plowed under by March. Hairy vetch grows so little during cool weather that it is not nearly as satisfactory in this region for green manuring.

In the Southern States, oats and common vetch should always be sown in the fall, October being the best month, though the planting may be delayed till the middle of December. Early fall planting gives the best results for green manuring.

Where the winters are severe, common vetch must be planted in the spring, but it is not often grown. It succeeds wherever field peas do well, except under dry-land conditions. but the field peas are usually preferable.

### RATE OF SEEDING.

Common vetch if sown alone is perhaps most often seeded at the rate of 1 bushel (60 pounds) to the acre. This is sufficient to produce a perfect stand if there is no winterkilling. Thus, in Oregon it is the common practice to sow 60 pounds of seed to the acre in the foothills where the drainage is good and the amount of winterkilling very small. If a mixture is sown, it varies from 30 pounds of vetch and 20 pounds of oats to double this combined quantity. In the valley lands, where a certain amount of loss is likely from winterkilling, especially where the soils become wet, a larger quantity of seed, namely, from 70 to 90 or even 120 pounds, is sown. If sown in combination with oats, 60 pounds of vetch and 40 pounds of oats are most commonly planted. The same rate of seeding is used as a rule whether the crop is grown for hay or for seed. Should the prospect be good for a high price for seed, the crop may be left to mature; otherwise it is cut for hay.

Some growers plant as high as 2 bushels of vetch to the acre when grown for seed alone. Such thick plantings stand up somewhat better, but the yield of seed will usually be reduced.

In California, when common vetch is planted as a green-manure crop the usual rate of seeding is 60 pounds to the acre, but as little as 40 pounds is sometimes sown.

In the Southern States there is nearly as much variability in the seeding rate as in Oregon; usually about 40 or 45 pounds of vetch and 1 to 2 bushels of oats are sown to the acre. A few growers plant only a thin scattering of oats, merely to help support the vetch.

### INOCULATION.

In the Pacific Coast States vetch is nearly always naturally inoculated, the necessary bacteria apparently being present in the soil. Elsewhere in the United States it is essential that the soil be inoculated at the first seeding of the land to vetch. Many failures with this crop are directly attributable to the lack of inoculation. Inoculated plants are easily recognized by the nodules which form on the roots. A common result in such seedings is a spotted field. The healthy vetch plants will be in patches, and the remainder will turn yellowish and die. This is especially true in poor soil. If a spotted field is planted again the next season it is practically certain that all the plants will be noduled and vigorous.

The surest method of inoculation is by scattering soil from an old vetch field or where vetch has been previously grown successfully.

The soil should be broadcasted at the rate of 250 to 500 pounds to the acre and harrowed in at once. The spreading should, if possible, be done on a cloudy day, as bright sunshine is destructive to the germs. Care should be taken not to introduce diseases or troublesome weeds.

A method that often gives good results is to cover each seed with a coating of soil from a well-inoculated field. If the seeds are first moistened, preferably with a thin solution of glue, and then mixed with dry soil, each will become thoroughly coated. Such seed should be well dried again or else sown at once.

Where inoculated soil is not available, pure cultures may be used, but in this case it is advisable to plant but a small area the first time, and preferably on good or manured land; otherwise, there is considerable liability to failure due to lack of inoculation. A small successful patch will furnish an abundance of soil for inoculation the next season.

The same germ produces nodules on both common and hairy vetch, so that soil from either will inoculate the other.

### WINTERKILLING.

The spring strain of common vetch often suffers much winterkilling when the temperature falls below 15° above zero Fahrenheit. The winter strain will stand from 5 to 10 degrees more of cold. Several factors, apart from the low temperature, contribute to the winterkilling. The amount of moisture in the soil, the natural drainage, and the time of seeding are factors having more or less effect. If rains immediately precede a freeze or the land is low or poorly drained, injury by frost heaving the soil is increased. Late seedings are injured more because the plants are small and tender, resulting often in poor or thin stands and correspondingly low yields of hay or seed. To offset this tendency some growers resort to heavy seeding, but where the winter is mild the resulting thick stand is detrimental to the yield of seed, if grown for that purpose. It is generally recognized that early plantings are injured least, and an increasing tendency among vetch growers is toward earlier seeding.

### HARVESTING FOR HAY.

Vetch should be cut for hay from the period of full bloom to formation of the first pods. It is commonly and satisfactorily cut with an ordinary mower with a swather attachment. After cutting, the vetch should be bunched with a horserake and then shocked with pitchforks. This handling should always be done before the vetch leaves are dry. It should be allowed to cure in the shocks several days, and, if possible, hay caps should be used, especially

if rainy weather is feared. Where a swather is not used, the cutting is considerably more difficult. In either case it is the common practice to allow the vetch to lie one day before shocking.

It is sometimes desirable to pasture fall-sown vetch in the spring, so as to bring the haying season somewhat later and also to prevent heavy lodging. This is quite commonly done in western Washington and western Oregon.

Common vetch yields from 1½ to 3½ tons of hay to the acre. An average yield in the Pacific States is 2½ tons, and in the Southern States somewhat less.

### HARVESTING FOR SEED.

Common vetch seed is produced in large quantities in the United States only in the Willamette Valley, Oreg. The methods of handling the seed crop vary, due partly to difference of opinion as to the best method, but more largely to the machinery available to the grower.

It is the general practice to cut vetch for seed as soon as the lower pods are fully ripe, at which time the upper pods will be fully formed and the plant will be carrying a maximum quantity of seed. Later cutting occasions more shattering of the seed, while earlier cutting results in a considerable percentage of immature seed. In a few places where but little seed is raised, the crop is cut with an ordinary mowing machine. Two men with pitchforks follow the mower and roll the vetch back from the uncut area, so as to enable the machine to get through when cutting the next swath. Sometimes the first swath cut is rolled on the uncut vetch, and when the succeeding swath is cut the two are rolled back out of the way. This puts the vetch in larger swaths than the first-mentioned method and also somewhat reduces the loss from shattering. These two mower and pitchfork methods were formerly used generally, but now have been largely superseded by other methods.

An ordinary grain binder is used by some growers, especially when the vetch is short and therefore quite erect or when it is grown with a supporting crop, such as oats. When thus harvested, the crop is put in shocks similar to grain shocks and allowed to remain until thrashed.

The most common way of harvesting vetch at present is to use an ordinary mower with a swather attachment. The swather, which is attached to and behind the sickle bar, rolls the vetch in a swath to the outside and leaves the way clear to cut the next swath.

Whatever method is used in cutting, the vetch is put at once into shocks and remains there till thrashed. The most important rule in the growing of vetch seed is to handle the crop rapidly and as little as possible when cut.

Common vetch varies considerably in the yield of seed to the acre. Five bushels is considered a low yield, and 20 to 25 bushel yields are near the maximum. The average acre yield is probably from 10 to 12 bushels.

### THRASHING.

Vetch is thrashed with an ordinary thrashing machine, but in order to reduce to a minimum the cracking of the seeds it is necessary to remove most of the concave teeth. Common vetch thrashes slowly, and consequently the expense is high, usually 20 to 25 cents a bushel, the cost being about the same whether the vetch is thrashed by the bushel or the thrashing machine is hired by the day. Vetch and oats in the sheaf are usually thrashed together for 10 cents a bushel. Vetch alone is inclined to wrap on the cylinders, but it is believed that this can be obviated, as in the case of cowpeas, by using sharpened teeth on the cylinder or on the concaves, or both.

### COMMON VETCH IN ROTATION.

Common vetch is nearly always grown in rotation. Continuous cropping to vetch for seed production usually results in reduced yields after two or three years, according to Oregon experience. The effects of cutting the crop for hay seem to be far less marked, but, nevertheless, continuous cropping to vetch is unnecessary and undesirable.

In Oregon and Washington common vetch is usually grown after spring-sown oats. It is advantageously used also in rotation with potatoes or corn.

In the region about Augusta, Ga., the most famous vetch-growing section in the South, the crop is mostly grown in rotation with Johnson grass, this being especially true on valley lands where the Johnson grass volunteers. Vetch, commonly mixed with oats or other small grain, is usually planted in October on well-prepared land and harvested by the middle of May. After the vetch crop is removed, the Johnson grass, more or less mixed with other grasses, begins to grow and commonly yields two hay cuttings during the season.

Where Johnson grass does not permanently occupy the land it is not advisable to sow it, as it is extremely difficult to eradicate. In this case various summer crops can be grown in the rotation, such as sorghum, cowpeas, sorghum and cowpeas combined, soy beans, peanuts, etc.

Common vetch is not well adapted to rotating with cotton unless used merely as a green manure. The vetch can not be harvested soon enough to permit the early planting of cotton, even when the seed is sown between the rows of cotton.

Common vetch is somewhat inclined to persist when once grown, especially where the winters are mild. Examples are known of its reseeding itself in pastures for five years. In cultivated fields it volunteers readily, which is especially objectionable in the wheat crop, owing to the difficulty of separating the vetch seed from the wheat. There is no danger of volunteer vetch unless a seed crop is grown or at least some of the seed allowed to ripen. In such cases, to avoid volunteer vetch the best plan is to follow with a crop of vetch and oats for hay, pasturing the stubble, so that no seed is allowed to ripen. A cultivated crop should be grown the next season, and then the land can be planted to wheat without any danger of the vetch volunteering.

### FERTILIZERS.

Information concerning the best fertilizers for common vetch is very limited. Barnyard manure is nearly always beneficial, and dairy farmers especially find it profitable to use on vetch fields.

In western Oregon it is now a common practice to apply gypsum, or land plaster, and special machines are often used to apply it.[1] It is commonly applied at the rate of 75 to 150 pounds to the acre.

In the South a fertilizer containing phosphoric acid and potash is often used, a common rate of application being 200 pounds of acid phosphate and 100 pounds of muriate of potash to the acre. Lime is also used with beneficial results.

Nitrogenous fertilizers are seldom used, as inoculated vetch plants utilize the nitrogen of the air. By analysis vetch contains 20 to 25 per cent of nitrogenous matter, much of which is from the air; in other words, a ton of dry vetch contains about 45 pounds of nitrogen, a considerable proportion of which is returned to the soil even when the crop is harvested as hay and fed on the farm.

### PASTURING.

Common vetch is utilized by Oregon and Washington dairymen for pasturage during winter, spring, and early summer. It is eagerly eaten by all farm live stock. As a general rule, the vetch is pastured only when the ground is dry, not only to avoid packing the soil but because both cattle and sheep are liable to bloat on vetch, especially in wet weather.

Even when vetch is grown primarily for hay or for seed a limited amount of pasturing is often desirable, especially where the growth is unusually rank or where it is desirable to bring the harvest later. Hogs should not be used for this purpose, as they kill out many of the plants by biting them off below the crown. Sheep and calves do the least damage in pasturing vetch designed for a hay or seed crop.

[1] See Circular 22, Bureau of Plant Industry, U. S. Dept. of Agriculture, 1909, entitled "Farm Methods of Applying Land Plaster in Western Oregon and Western Washington."

### SOURCES OF SEED.

Common-vetch seed has been extensively grown for some years in western Oregon, and practically all of this seed has been marketed on the Pacific coast. Were it not for high freight rates all of the seed required in the United States could be grown in this section. The price paid to growers has varied greatly, the maximum being about 4 cents a pound, but in 1909, owing to extraordinary conditions, many realized but 1½ cents a pound, at which price the seed crop is not profitable.

Practically all of the common vetch seed used in the Southern States is from Europe. Its wholesale price at European ports is usually from 2 to 2½ cents a pound and the freight to American ports is about one-quarter of a cent a pound. The prices that American vetch-seed growers obtain are practically controlled by the price of European seed.

Common vetch seed retains its vitality well for about three years, after which it rapidly deteriorates. Very fresh seed of common vetch does not germinate as well as that a few months old. Table I shows the results of tests of seeds of common vetch of different ages by Mr. Edgar Brown, Botanist in Charge of the Seed Laboratory of the United States Department of Agriculture.

TABLE I.—*Germination of seed of common vetch 18 months old compared with that 6 months old.*

| Germinated on— | Percentage of germination. | |
|---|---|---|
| | Seed 18 months old. | Seed 6 months old. |
| Third day | 91 | 68 |
| Sixth day | 3 | 12 |
| Tenth day | 4 | ..... |
| Fourteenth day | ..... | 11 |
| Nineteenth day | ..... | ..... |
| Twenty-fourth day | ..... | 2 |
| Total germination. | 98 | 93 |
| Hard seed | 2 | 6 |
| Dead seed | 0 | 1 |

### USE AS GREEN MANURE.

Common vetch has in the past been more extensively employed in the citrus districts of California as a green-manure crop than any other plant. Its advantages lie not alone in the large tonnage that it yields, but also in the fact that it grows well in the cool weather of winter, permitting it to be plowed under early in spring. It is best sown in late August or early September with irrigation and plowed under in February and March.[1]

It is also well adapted to similar use in the Southern States, but it is as yet not much utilized for this purpose.

[1] See Bulletin 190, Bureau of Plant Industry, U. S. Dept. of Agriculture, entitled "Orchard Green-Manure Crops in California," for a detailed description of the use of common vetch as green manure.

## HAIRY VETCH.

Hairy vetch is also known as sand vetch, Russian vetch, Siberian vetch, and villous vetch. Many American seedsmen advertise hairy vetch as "winter vetch," a term which European seedsmen use only for the winter strains of common vetch. As the term "winter vetch" is applied to two very different plants, it is best to avoid its use.

Agriculturally, hairy vetch differs from common vetch in being much more hardy and in acting as a biennial if planted in the spring. Botanically, it is easily distinguished by the narrower, more numerous leaflets, and the hairy, somewhat silvery, herbage. The flowers are blue-violet, borne in one-sided clusters of about 30 on a long stalk.

The pods of hairy vetch shatter much more easily than those of common vetch, and the seeds are smaller, globular, and nearly black.

### CLIMATIC AND SOIL REQUIREMENTS.

Hairy vetch succeeds well wherever common vetch does and can be grown much farther northward, withstanding well the winters of eastern Washington, Michigan, New York, and even of New England. The proved superiority of New England home-grown seed as compared with the imported is perhaps due to increased hardiness. Success has been had with it in nearly every State of the Union, but it is likely to become of importance mainly where alfalfa and red clover do not succeed or do not meet the requirement of a short rotation.

Hairy vetch succeeds especially well on sandy soils, but can be grown on any well-drained land. It is markedly drought resistant, often making a good crop under dry conditions where common vetch fails. It is quite resistant to alkali and will germinate well in soils too alkaline for most legumes.

### SOWING.

Hairy vetch withstands very cold weather and may be sown in late summer or early fall in all Northern States. This is usually the best time, but in the semiarid regions the soil-moisture conditions usually necessitate spring sowing. If the crop is to be kept on the land two seasons, the seeding should be in the spring in the Northern States. In other States early fall sowing is much better, as hairy vetch does not withstand severe summer heat. It may be sown either alone or with a small grain as a supporting crop. On sandy land, rye (fig. 2) is the best grain to use, and in the North, where the winters are severe, either this or wheat must be used if the vetch is sown in the fall.

The seeds of hairy vetch are only about half as large as those of common vetch, and it is rare that more than 20 or 25 pounds to the

acre are sown. Enough rye or other small grain to make a thin stand should be added, generally half a bushel to the acre.

In a few instances a mixture of common vetch, hairy vetch, and oats or other grain is used, but this is not advisable, as hairy vetch matures two weeks later than common vetch. A better plan is to grow separate fields of each vetch in the mixture, as by this plan the haying season can be considerably extended.

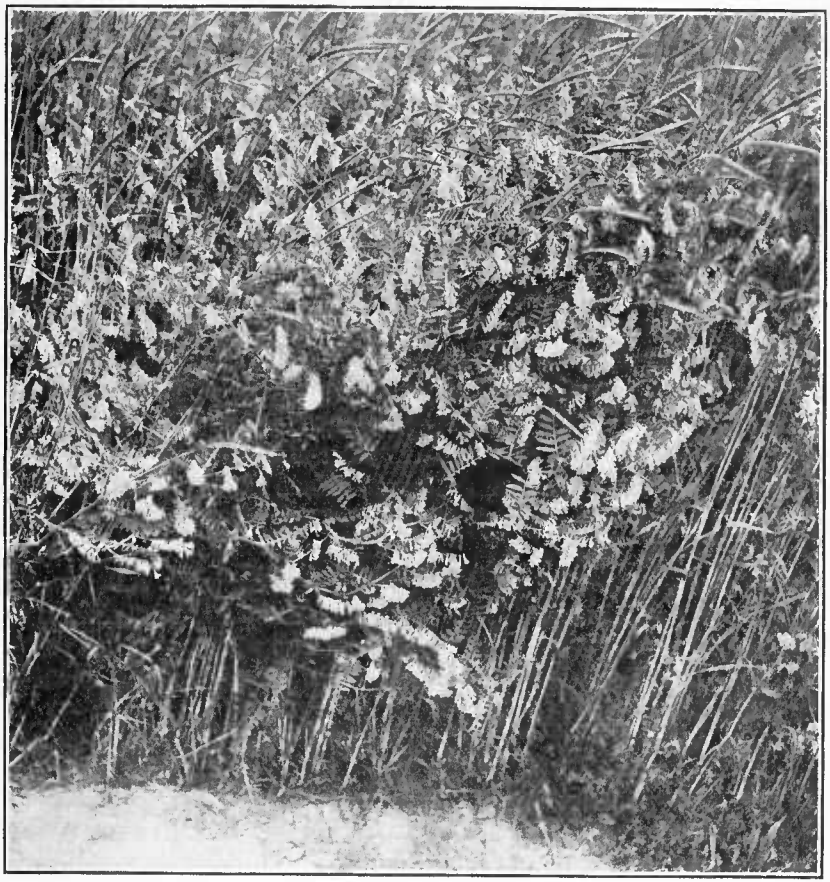

FIG. 2.—Hairy vetch and rye growing together in Virginia.

No special preparation of the land is necessary for hairy vetch, but the seed should be well firmed. In periods of drought the seed will remain a long time in the soil and then germinate. The so-called hard seed, a small percentage of which is nearly always present, will remain a year or more in the soil without germinating.

### INOCULATION.

Inoculation of the soil when hairy vetch is planted for the first time is a matter of prime importance, as failure due to a lack of

the proper germs in the soil is a common experience. The surest method is to bring soil from an old field of vetch, either hairy or common, scatter it over the field at the rate of 300 pounds to the acre, and immediately harrow it in. If screened, it may be sown with a drill. Where soil is not available, the artificial cultures may be used, but in this event only a small field should be planted, as the cultures do not always succeed and the risk is too great to warrant a farmer in planting a large field on land not inoculated. Where inoculation has once been successful it will not be necessary to inoculate in succeeding years. A partially inoculated field often has a spotted appearance when young, the healthy plants being green and the uninoculated ones yellow. If such a spotted field is planted again the following season it is practically certain that all the plants will be inoculated.

### SOURCES OF SEED.

Hairy vetch seed before the war was nearly all obtained from Russia. Its wholesale prices at European ports then varied from 3 to 7 cents a pound. About 500,000 pounds were imported each year.

Hairy vetch seed is grown in small quantities in Washington Oregon, Michigan, Maryland, Ohio, Connecticut, and other Northern States. In the South it seldom sets a large number of pods, but fair success has been had in Mississippi. The seed can be readily separated from oats, but is much more difficult to separate from wheat or rye.

Under very favorable conditions yields as high as 11 bushels to the acre have been obtained, but as a rule only 3 to 5 bushels are secured. There is no standard method of harvesting. The principles applied to common vetch apply to hairy vetch, except that greater care is essential, because it shatters much more easily.

### GROWING SEED FOR HOME USE.

Without doubt hairy vetch would be far more extensively employed as a crop if the seed were cheaper. There is little likelihood that European seed will ever reach the farmer at a satisfactory price, but seed can be readily grown in nearly every State in the Union at far less expense than it can be purchased.

At the Mississippi experiment station hairy vetch was harvested from the same piece of land five years in succession without resowing, enough seed shattering during harvest to produce a perfect stand. The only treatment has been to plow the land after harvesting the vetch and then sow to cowpeas. The cowpeas were cut for hay, after which the vetch quickly made a stand.

This plan is adapted to all the States south of the Ohio and Potomac Rivers. Northward the season is too short for the cowpeas, but long enough to grow a hay crop of millet.

Hairy vetch, when cut after some of the seed has matured, if not thrashed for seed should be put in a barn with a tight floor, where much of the seed will rattle to the bottom. Vetch that is cut so late is not of high feeding value, but the stock will eat much of it and the rest can be used as bedding. In taking out the straw from the mow care should be exercised to shake out any loose seeds it may contain. By this simple method a farmer can easily grow his supply of vetch seed at a low cost.

### USES OF THE CROP.

Hairy vetch is adapted to nearly as wide a range of uses as red clover, and in regions where red clover for any reason does not succeed it is the best substitute. It makes excellent hay, though it is rather difficult to mow. It furnishes pasturage of high quality and may be grazed somewhat in the spring without materially reducing the hay crop. When planted in the spring it will permit a large amount of grazing the first season and a full hay crop the next. As a winter cover crop it gives satisfaction if sown early, but it makes a slower growth in cold weather than common vetch.

It has been found the best winter green-manure and cover crop for tobacco fields in the Connecticut Valley.[1] It is well adapted to this purpose throughout the Northern States, and where neither red clover nor crimson clover succeeds is the best crop for this use, especially on sandy soils.

Where once established it is inclined to persist more or less from year to year as a weed. This is not a serious matter, except in wheat-growing sections, as hairy vetch seed is separated from wheat with difficulty. It is therefore seldom advisable to grow this vetch where wheat is produced. Its ability to persist, however, makes it useful in pastures, especially in the South.

### HAIRY VETCH IN ROTATION.

Hairy vetch is very well adapted as a winter crop in the South to grow in rotation with such crops as cowpeas, soy beans, sorghums, millet, and late-planted corn. When Johnson grass occupies the land it is a common practice to plow and sow hairy vetch in the fall. Following its harvest, two crops of Johnson grass hay are usually cut.

It is also well adapted, like crimson clover, to plant in corn and sometimes is mixed with the clover. Hairy vetch will germinate under much more unfavorable conditions than crimson clover and often gives a stand when the clover fails. If thus sown it is best to mix rye with the vetch. It is not well adapted to plant in the rows of cotton, as it makes too little growth in winter to produce much

[1] See Bulletin 149, Connecticut Agricultural Experiment Station.

green manure and can not be cut for hay soon enough to permit the early planting of cotton.

In the Northern States hairy vetch hay can be cut early enough to grow a crop of millet hay the same season.

### NARROW-LEAF OR AUGUSTA VETCH.

Narrow-leaf vetch is very nearly related to common vetch, but distinguished by its narrower leaflets, smaller flowers, black pods, and round, smaller seeds. It is naturalized and thoroughly established from Georgia to Pennsylvania, and occurs even as far north as Nova Scotia. In Georgia it is highly appreciated in the vetch-growing sections and sometimes makes up a considerable portion of the hay. It maintains itself from year to year, as some seeds mature before common vetch is ready to cut for hay. On pastures it remains as a permanent element and is highly appreciated.

Seed is now on the market in considerable quantity. Some of this seed is obtained from the cleaning of wheat in Minnesota, as narrow-leaf vetch occurs as a weed in the grain fields, and some is imported from Europe.

Narrow-leaf vetch is a very valuable species that will be more largely grown now that more seed is available. Recently a variety has been discovered that does not shatter its seeds easily, and it is believed that this in a few years will still further help the seed problem.

### BLACK BITTER VETCH.

Black bitter vetch is largely grown in parts of Asiatic Turkey, whence seed has been shipped in large quantity to England and other countries as feed for live stock, especially sheep. The price of the seed is variable, but it can undoubtedly be grown more cheaply than that of any other vetch, owing to the erect habit of the plant and its great productiveness. The seeds are conical in shape and smaller than those of common vetch, so that good stands are obtained with about 30 pounds to the acre. This vetch is not readily eaten by live stock, but it has been found to be excellent as a winter green-manure crop in California both on account of its erect habit and the large growth it makes in cool weather. Under California conditions it also produces splendid crops of seed, and it is predicted that it will replace other green-manure crops to a large extent.

### PURPLE VETCH.

Purple vetch has much resemblance to hairy vetch, but is a smooth annual with dark-purple flowers. It is slightly less hardy than common vetch. The seed habits are excellent, and it can be grown about as cheaply as common vetch.

The seed is now produced in considerable quantity in western Oregon. Purple vetch has proved exceedingly satisfactory as a winter green-manure crop in southern California. In the semiarid regions it has produced larger yields of hay from spring plantings than any other vetch.

### SCARLET VETCH.

Scarlet vetch is the most erect growing of the annual slender-stemmed vetches. It is characterized by its narrow leaflets and beautiful scarlet flowers in one-sided clusters. It is even less hardy than common vetch, but usually withstands the winters of the Pacific coast and the Cotton States. Only rarely does it produce seed in large quantities, and the pods shatter readily, so that the seed is comparatively expensive. The plant is quite drought resistant and from spring sowings has succeeded better in the semiarid regions than any other vetch except the purple. It is very doubtful whether the seed of this vetch will ever be cheap enough to compete with other varieties.

### NARBONNE VETCH.

Narbonne vetch is much like common vetch, but with stouter, more erect stems, larger, somewhat fleshy leaflets, and larger seeds. It is not very hardy and turns black under severe summer heat. In the United States it is well adapted only to the Pacific coast, but it has no apparent advantage over common vetch and the seed is more expensive. Commercial seed comes from southern France and costs about 50 per cent more than common vetch.

### HUNGARIAN VETCH.

Hungarian vetch is an annual. It is less viny than common vetch. Under good conditions the stems attain a length of 3 to 4 feet. The entire herbage is very hairy, giving the plant a silvery gray appearance. The leaves are linear and the flowers, which are cream or creamy white with few brown stripes, are borne in clusters of four, or sometimes less. It has succeeded well wherever tested and promises to be of especial value on poorly drained lands too wet for other vetches. It is more winter-hardy than common vetch, but not as hardy as woolly-podded and hairy vetch. Its seed habits are excellent and good crops of seed have been produced in experimental work in western Oregon.

### WOOLLY-PODDED VETCH.

Woolly-podded vetch is closely related to hairy vetch and is somewhat less hardy and much earlier, maturing even before common vetch. It differs from hairy vetch in having finer stems, nearly

smooth leaves, and purple flowers. It bears odorous flowers in great abundance, attracting bees in large numbers. It has succeeded splendidly wherever tested, and on account of its earliness and good seed-bearing qualities has some advantages over hairy vetch. Excellent seed crops are produced in western Oregon, and it is believed the seed will be cheaper than hairy vetch. It persists even more than hairy vetch and is already naturalized in western Oregon.

## VETCH SEED AND ITS ADULTERANTS.[1]

### IMPORTANCE OF PROPER SEED.

Success with the vetches rests fundamentally on the use of proper seed. The seed should be true to name and free from adulterants and noxious impurities. Formerly these conditions prevailed with most of the seed in the trade, but more recently much of the seed, of hairy vetch particularly, has been very poor in quality. While actual misbranding is infrequent, adulteration by the use of large quantities of seed of other vetches and similar plants has become a common practice. It therefore behooves the purchaser of vetch seed to familiarize himself with the character of his seed before sowing. The farmer can determine for himself the essential characteristics of vetch seed suitable to be sown.

### EXAMINATION OF SEED.

From a practical standpoint the examination of vetch seed should determine the following questions:

(1) Is the seed common vetch or hairy vetch?
(2) Is old, dead seed present as an adulterant?
(3) Is other vetch seed or similar seed present as an adulterant?
(4) Is the seed adulterated with low-grade screenings?
(5) Are specially noxious weed seeds present?
(6) Does a considerable part of the seed consist of hard seed incapable of prompt germination?

Purchasers of seed should have no difficulty in distinguishing the seeds of common and hairy vetches.

Seeds of common vetch (fig. 3) average considerably larger than those of hairy vetch. They are slightly flattened, preventing them from rolling readily. The profile of most of the seeds is somewhat angular. The surface is more or less distinctly mottled, some of the seeds being uniformly light brown or greenish. The brightest seeds usually show three colors, light brown spotted with patches of darker brown and further spotted or speckled with black (fig. 4, *a*). Some seeds show but the two shades of brown (fig. 4, *b*). In old seed the general color is darker and the mottling is obscure.

Seeds of hairy vetch (fig. 5) average smaller than those of common vetch. They are nearly spherical and roll readily. The usual color

[1] By F. H. Hillman, Assistant Botanist, Seed Laboratory.

of pure trade lots is grayish or leaden black. New seed is brown or greenish and often faintly mottled.

A conclusive distinction between the two kinds is seen in the seed scars with the aid of a magnifier. The scar of common vetch (fig. 6) is narrowly wedge shaped and has a slight ridge extending lengthwise through the center. This ridge is usually lighter colored than the surrounding surface. In hairy vetch the scar (fig. 7) is relatively broader, oval wedge shaped, and light brown or dark brown. There is no light-colored central ridge, but the scar is sometimes split along the center, producing a whitish line, as shown in figure 7, *a* and *b*.

FIG. 3.

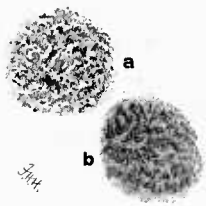


FIG. 4.

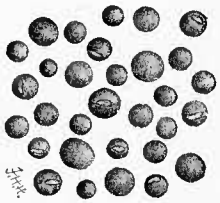

FIG. 5.

FIG. 6.


FIG. 7.

FIG. 8.

FIG. 9.

FIG. 3.—Seeds of common vetch (*Vicia sativa*). (Natural size.)
FIG. 4.—Types of mottling of seeds of common vetch; *a* and *b*, from light and dark seeds, respectively. (Enlarged.)
FIG. 5.—Seeds of hairy vetch (*Vicia villosa*). (Natural size.)
FIG. 6.—Seed scar of common vetch. (Enlarged.)
FIG. 7.—Seed scar of hairy vetch; *a* and *b*, forms showing the white, central slit of some scars. (Enlarged.)
FIG. 8.—Seeds of narrow-leaf vetch (*Vicia angustifolia*), a deceptive adulterant of hairy vetch seed. (Natural size.)
FIG. 9.—Seed scar of the narrow-leaf vetch shown in figure 8. (Enlarged.)

### ADULTERATION OF HAIRY VETCH SEED.

When one is familiar with the appearance of hairy vetch seed and can recognize the seed by means of the scar as seen under a magnifier, the detection of other seeds used in adulteration is not difficult.

The most deceptive adulterant is the black seed of narrow-leaf vetch (fig. 8), which as seen with the naked eye is almost identical with seed of hairy vetch. These seeds average somewhat smaller and usually have a slight luster. The seed scar (fig. 9) is distinctly different from that of hairy vetch in being more nearly wedge

shaped, black, and in having a slender but distinct ridge along the center, similar to that in the scar of common vetch. This vetch volunteers readily and usually constitutes a considerable proportion of low-grade hairy vetch seed. Along with this black-seeded adulterant a considerable quantity of gray or mottled narrow-leaf vetch seed of similar size and shape is usually to be found. The lighter color of this seed aids in detecting the adulterant. Many lots of hairy vetch seed consist largely of small-seeded common vetch, suggesting the use of screenings of this kind as an adulterant.

Misbranding usually consists of the substitution of common vetch for that of hairy vetch. This deception should readily be detected.

The use of old, dead seed as an adulterant can be satisfactorily determined only by a germination test. Seed capable of prompt germination should mostly sprout within four or five days. Dead seed in this time will become swollen and soft, but will fail to sprout.

Mr. Edgar Brown, of the Seed Laboratory, finds that the difference in color of the interior of the seed shown by different kinds of vetches affords a ready means of detecting the use of other vetch seed as an adulterant of hairy vetch. Crushed hairy vetch seed is of a lemon-yellow color, somewhat lighter on the flat than on the rounded surface. The crushed seed of most of the other vetches occurring with the seed of hairy vetch varies in color from a dark fawn to reddish orange.

Crush a small handful of seed and if there are any fawn, salmon, or reddish orange colored pieces the seed is not pure hairy vetch.

### HARD SEED.

Hairy vetch seed contains varying proportions of so-called hard seed, in some cases as much as 50 per cent, which fails to sprout promptly because it is not able to absorb water readily. With seed grown in humid regions the proportion of hard seed usually increases during the first year and then gradually decreases, but when grown in a dry climate the hard seed develops sooner after ripening. Hard seed should be treated in a special machine which will scratch the seed coats before sowing in order to hasten germination. The germination test should be continued for at least 14 days.

### WEED SEEDS IN VETCH SEED.

The use of low-grade screenings in adulteration usually introduces various weed seeds which are few or wanting in the best vetch seed. Some of these are generally recognized as noxious, and seed containing them should not be sown.

Corn cockle, or cockle, seeds (fig. 10, *a*) probably are the commonest of the weed seeds with vetch seed, particularly with seed of hairy

vetch. This seed is recognized by its spiny surface, angular form, and dark-brown or black color.

Cow cockle seeds (fig. 10, *b*), often referred to as cockle, differ from the preceding in being spherical and not spiny. They are black and about the size of the smallest hairy vetch seeds.

The seeds of cleavers (fig. 10, *c*) are somewhat hemispherical, the flattened face having a depression or cavity at the scar. The surface is roughened and gray or light brown. The gray color aids in distinguishing these seeds from vetch seed.

Field bindweed seeds (fig. 10, *d*) are angular, brown or gray, the surface being finely roughened. They are similar in form to those of the morning-glory. They are not common in vetch seed except in low-grade lots.

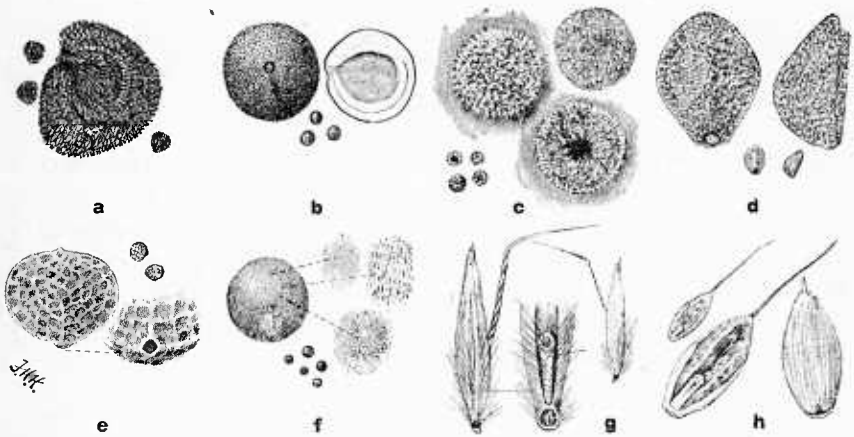


FIG. 10.—Common weed seeds in vetch seed: *a*, Corn cockle; *b*, cow cockle; *c*, cleavers; *d*, field bindweed; *e*, ball mustard; *f*, English charlock, or wild mustard; *g*, wild oats; *h*, darnel. (Enlarged and natural size.)

Ball mustard seeds (fig. 10, *e*) are inclosed singly in small, straw-colored or brown net-veined pods. The pods are somewhat flattened and are about the size of the smaller hairy vetch seeds.

English charlock, or wild mustard, seeds (fig. 10, *f*) occur in some lots of poorly cleaned seed of hairy vetch. The charlock seeds are smaller than those of hairy vetch, and they are spherical, black or brown. They should not be confounded with the previously described cow cockle seeds, which are larger.

Wild oat seeds (fig. 10 *g*) are similar to the seed of the cultivated oat, but can be distinguished by the cup-shaped scar at the base. This seed is either brown or straw colored. Some seeds have brownish hairs, and a twisted awn from near the middle is more or less evident.

Darnel seeds (fig. 10, *h*) are similar to those of rye-grass, but are larger and heavier. The slender awn is often broken from the apex of the seed.

## SUMMARY.

Common vetch is an annual legume extensively grown on the Pacific coast, to a less extent in the Southern States, and rarely in the Northern States. There are two important strains—winter vetch, sown in the fall, and spring vetch, sown in the spring.

Hairy vetch is a biennial species which is much more hardy. It is usually sown in late summer or early fall and can be grown in almost every part of the United States.

The seeds of common vetch are somewhat flattened and brownish in most forms. Those of hairy vetch are smaller, globular, and black.

Vetches should not, as a rule, be sown in rotation with wheat, as they tend to volunteer and the seed is very difficult to separate from wheat. If grown in rotation with wheat they should not be allowed to mature seed, but where this is done they should be followed by a cultivated crop before wheat is again planted.

Vetches are weak stemmed and should generally be planted in a mixture with a small grain to support them.

Vetches make excellent feed, either green or as hay, and are also exceedingly useful as cover and green-manure crops.

Common vetch, even the winter strain, will not ordinarily withstand more cold than 15° above zero Fahrenheit, while hairy vetch is very hardy.

Common vetch requires fairly good soil to succeed, while hairy vetch is less particular and grows well in poor, especially sandy, land.

Common vetch will not grow in alkali soil nor is it drought resistant, while hairy vetch will stand considerable alkali and much drought.

Vetches are usually seeded with enough small grain to make half a stand. Sixty pounds of common vetch seed are needed to the acre, or 40 pounds of hairy vetch.

Inoculation is necessary for the successful growth of vetches. This should always be supplied, if possible, where vetches are sown for the first time.

Common vetch seed should cost about 3 cents a pound. Hairy vetch seed costs at least twice as much.

Hairy vetch is perhaps the best legume to use where red clover fails, and this is especially true in sandy soils. In the Northern States it can be used to seed in corn at the last cultivation and will furnish a subsequent crop for green manure or hay.

The high price of the seed of hairy vetch is the principal reason why it is not grown extensively. Farmers can easily grow their own seed by devoting a special field to this purpose, as described on page 15.

Hairy vetch, with seed at a reasonable price, is the best winter legume for all localities in the eastern half of the United States where red clover fails or where crimson clover is not a success.

Common vetch does not withstand great summer heat and should not be planted in the spring in the eastern United States. It does succeed in the northernmost States when spring sown, but is usually not as desirable as field peas.

Seed of hairy vetch is often adulterated, especially with that of common vetch and of wild vetches, and weed seeds are frequently present. Careful examination with the aid of the descriptions and illustrations in this bulletin will enable anyone to determine whether the seed is pure.

Several other species of vetch are grown to a limited extent. The purple and the black bitter vetches are proving to be excellent green-manure crops in California. Scarlet vetch and purple vetch are well adapted wherever common vetch will grow and are much more drought resistant. Woolly-podded vetch is similar to hairy vetch and much earlier, but is not so hardy, though more hardy than common vetch. Hungarian vetch is excellent on the Pacific coast and succeeds better than any other variety on poorly drained land. Narrow-leaf vetch is naturalized in the Atlantic Coast and Southern States and is valued as a constituent of pastures.

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